

FOR USE ONLY BY THE EXAMINER

**CLAIMS WITH INTERSTITIAL REFERENCE NUMBERS
FOR DISCUSSION PURPOSES ONLY**

CLAIMS

What is claimed is:

1. An apparatus for determining time remaining for fluid flow at a temperature from a fluid outlet **[14]** which receives fluid from a fluid source **[18]**, comprising:
 - a first temperature sensor **[22]** for sensing fluid temperature at a fluid outlet **[14]**;
 - a second temperature sensor **[34]** for sensing fluid temperature at a fluid source **[18]**;
 - a communication link **[29]**; and
 - a controller **[38]** in communication with said first temperature sensor **[22]** and said second temperature sensor **[34]** via said communication link **[29]**, for comparing sensed fluid temperatures to determine time remaining for fluid flow at a temperature.
2. The apparatus of claim 1 wherein said communication link **[29]** comprises a wireless communication link.
3. The apparatus of claim 2 wherein said wireless communication link **[29]** comprises a radio frequency communication link.
4. The apparatus of claim 1 wherein said communication link **[29]** comprises a hardwire communication link.

5. The apparatus of claim 1 wherein said first temperature sensor [22] comprises an integrated circuit temperature sensor [22].

6. The apparatus of claim 1 wherein said first temperature sensor [22] comprises a thermocouple.

7. The apparatus of claim 1 wherein said first temperature sensor [22] comprises a sensor system comprising [22]:

- a temperature sensor [24];
- a radio frequency transmitter [28];
- a power supply [30]; and
- a housing enclosing said temperature sensor [24], radio frequency transmitter [28], and power supply [30] for protection from the environment.

8. The apparatus of claim 7 wherein said sensor system [22] further comprises a sleeve [26] for placement in line with fluid flow to a fluid outlet.

9. The apparatus of claim 1 wherein said second temperature sensor [34] comprises an integrated circuit temperature sensor.

10. The apparatus of claim 1 wherein said second temperature sensor [34] comprises a thermocouple.

11. The apparatus of claim 1 wherein said second temperature sensor [34] comprises a sensor system comprising:

- a temperature sensor [36];
- a radio frequency transceiver [32];
- a power supply [40]; and
- a housing enclosing said temperature sensor [36], radio frequency transceiver [32], and power supply [40] for protection from the environment.

12. The apparatus of claim 1 further comprising a display device **[42]** for relaying information to a user.
13. The apparatus of claim 12 wherein said display device **[42]** is in communication with said first temperature sensor **[22]** and said controller **[38]**.
14. The apparatus of claim 13 wherein said display device **[42]** comprises:
a display **[44]**;
a radio frequency transceiver **[46]**; and
a power supply **[48]**.
15. The apparatus of claim 12 wherein said display device **[42]** comprises an audio device **[52]**.
16. The apparatus of claim 1 wherein said controller **[38]** comprises a device selected from the group consisting of EEPROMs, microcontrollers, and microprocessors.
17. A method of determining time remaining for fluid flow at a temperature from a fluid outlet **[14]** which receives fluid from a fluid source **[18]**, the method comprising:
providing temperature sensors **[22, 34]** at a fluid outlet **[14]** and fluid source **[18]**;
providing a controller **[38]**;
sensing fluid temperature at the fluid outlet **[14]** and fluid source **[18]**;
communicating sensed fluid temperatures to the controller **[38]**; and
determining time remaining for fluid flow at a temperature from the fluid outlet **[14]** with the controller **[38]** based upon the sensed fluid temperatures.

18. The method of claim 17 wherein the step of communicating sensed fluid temperatures to the controller [38] comprises communicating sensed fluid temperatures to the controller [38] via a communication link selected from the group consisting of wireless communication links [29] and hardwire communication links [29].

19. The method of claim 18 wherein the step of communicating sensed fluid temperatures to the controller [38] via a wireless communication link [29] comprises:

sensing temperature at the fluid outlet [14];

converting the sensed temperature to a radio frequency signal [28];

transmitting the radio frequency signal [28]; and

receiving the transmitted radio frequency signal at a receiver [32] in communication with the controller [38].

20. The method of claim 17 further comprising the step of displaying time remaining for fluid flow at a temperature from a fluid outlet [14] on a display [44] [see step 82].

21. The method of claim 20 wherein the step of displaying time remaining for fluid flow at a temperature from a fluid outlet [14] on a display comprises:

converting time remaining information from the controller [38] to a radio frequency signal [32]; and

transmitting the time remaining radio frequency signal [32] to a receiver [46] in communication with a display [44].

22. The method of claim 17 further comprising the step of displaying fluid outlet [14] temperature on a display [44] [see step 70].

23. The method of claim 22 wherein the step of displaying fluid outlet **[14]** temperature on a display **[44]** comprises:
- converting sensed fluid outlet temperature to a radio frequency signal **[28]**; and
 - transmitting the fluid outlet temperature signal to a receiver **[46]** in communication with a display **[44]**.
24. The method of claim 17 further comprising the step of audibly indicating **[52]** the time remaining for fluid flow at a temperature from a fluid outlet **[14]**.
25. A method of determining time remaining for fluid flow at a temperature from a fluid outlet **[14]** which receives fluid from a fluid source **[18]**, the method comprising:
- sensing fluid temperature at a fluid outlet **[68]**;
 - sensing fluid temperature at a fluid source **[72]**;
 - comparing at least two sensed fluid temperatures **[74, 76, 80, Eqns. 1, 2, 3]**; and
 - determining time remaining for fluid outlet flow at a temperature based upon the comparing step **[80, Eqn. 3]**.
26. The method of claim 25 wherein the step of comparing at least two sensed fluid temperatures comprises subtracting a previously sensed temperature from a later sensed temperature **[74, Eqn. 1]**.
27. The method of claim 25 wherein the step of comparing at least two sensed fluid temperatures comprises determining a rate of temperature change **[Eqn. 2]** from at least two sensed fluid source temperatures.

28. The method of claim 27 wherein the step of determining time remaining **[80, Eqn. 3]** for fluid outlet flow at a temperature comprises:

comparing a sensed fluid outlet temperature to a sensed fluid source temperature **[Eqn. 3 numerator]**; and

determining time remaining for fluid outlet flow at a temperature based upon the comparison between a sensed fluid outlet temperature and sensed fluid source temperature **[Eqn. 3 numerator]** and the rate of temperature change **[Eqn. 2 and Eqn. 3 denominator]**.

29. A method of determining time remaining for fluid flow at a temperature from a fluid outlet which receives fluid from a fluid source, the method comprising:

providing a fluid outlet fluid temperature **[CT or DT]**;

sensing fluid temperature at a fluid source **[72]**;

comparing at least two fluid temperatures **[74, 76, 80, Eqns. 1, 2, 3, using CT or DT]**; and

determining time remaining for fluid outlet flow at a temperature based upon the comparing step **[80, Eqn. 3]**.